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1977 SUMMARY OF RESULTS OF
FIELD EXPERIMENTS

JANUARY 1978

1. INOCULATION
 - 1.1 High rainfall
 - 1.2 Low rainfall
2. CLOVER SCORCH
3. RYE GRASS TOXICITY



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PLANT RESEARCH DIVISION

DEPARTMENT OF AGRICULTURE
WESTERN AUSTRALIA

LIST OF EXPERIMENTS

1. The responses of varieties of Trifolium yannanicum to inoculation with different strains of rhizobia. DENMARK
2. The response of T. yannanicum to inoculation over two growing seasons. DENMARK
3. The response of white and strawberry clovers to inoculation. DENMARK
4. The response of sub clover to inoculation - spaced row trial. MERREDIN
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12. Clover varietal screening for tolerance to clover scorch. DENMARK
13. Attempts at inducing slime and gall development on ryegrass in the glasshouse.

1. INOCULATION

Summary

Interesting results were obtained on the inoculation of yanninicums at Denmark. None of the new rhizobia (CC numbers) showed any superiority over the current commercial inoculant strain (WU95).

Two designs were used for all clover inoculation trials: the conventional row trial used for first year screening, and a plot trial, in which four rows were sown 17.5 cm apart in each plot. With this plot design it was expected that information would be gained in the second year on nodulation and growth to determine if first year responses persisted into the second year.

It was again apparent that strain TA1 was poor on Woogenellup. This is particularly important since TA1 is the strain in commercial peats for the white clover group and this peat should not be used to inoculate Woogenellup.

The nodulation and growth of the hand sown trials in the wheatbelt were badly affected by drought for the second successive year. No results were obtained from the Wilgoyne site and limited information only came from the two trials at Perenjori. Strain WU95 again proved satisfactory on Nungarin.

1.1 High Rainfall

Trial 1. 77D6/2994 EX.

The response of Trifolium yannanicum to inoculation on new land at Denamark.

Locality: Denmark Research Station

Soil: Loamy gravel. Jarrah.

History: New land cleared 1975.

Fertilizer: 1 tonne lime autumn 1977. At sowing 200 kg/ha mix No. 1. Cu, Zn, Mo superphosphate; 400 kg/ha plain super; 200 kg/ha muriate of potash; 50 kg/ha MnSO₄.

Sowing: Lime pelleted inoculated seed sown 4.0 cm apart in 2 metre rows, 50 cm apart. Sown into moist seed bed April 20.

Treatments: Yanninicums (39327YB, Trikkala, Larisa, Yarloop) and Woogenellup. Inoculants Nil, CC2238b, CC2480a, CC2484g, CC2470g, WU95 and TA1).

Nodulation: June 14.

Host	Nil	CC 2238b	CC 2480a	WU95	TA1	CC 2484g	CC 2470g	Mean
39327YB	2.08	2.57	2.60	2.53	2.46	2.38	2.65	2.47
Trikkala	2.22	2.93	2.58	2.97	2.87	2.97	2.86	2.78
Larisa	1.80	2.79	2.34	2.65	2.55	2.63	2.61	2.48
Yarloop	1.65	2.71	2.57	2.87	2.58	2.78	2.96	2.59
Woogenellup	1.96	3.00	2.59	2.91	2.27	2.95	2.93	2.66
Mean	1.94	2.80	2.54	2.79	2.55	2.75	2.81	2.60

Coeff. of variation 8.82%

LSD (P<0.05) Treatments 0.32

There was a significant host x inoculum interaction.

Visual Growth Ratings - June 14.

Host	Nil	CC 2238b	CC 2480a	WU95	TA1	CC 2484g	CC 2470g	Mean
39327YB	2.5	4.5	4.25	3.25	4.75	3.50	4.0	3.82
Trikkala	2.25	4.0	4.75	3.50	4.50	4.25	4.75	4.00
Larisa	3.0	4.25	4.25	3.25	4.25	4.25	4.25	3.93
Yarloop	2.5	4.25	4.50	3.75	4.0	4.0	4.75	3.96
Woogenellup	2.75	4.50	5.0	4.0	3.50	4.5	4.25	4.07
Mean	2.60	4.30	4.55	3.55	4.20	4.10	4.40	3.96

Coeff. variation - 16.59%

LSD (P 0.05) Treatment 0.921, Host N.S.
Inoc. 0.411.

Dry weight (mgm) - June 14.

Host	Nil	CC 2238b	CC 2480a	WU95	TA1	CC 2484g	CC 2470g	Mean
39327YB	25	37	43	41	42	37	47	39
Trikkala	34	60	47	57	50	59	51	51
Larisa	21	38	27	34	36	38	33	32
Yarloop	22	32	40	36	36	38	46	36
Woogenellup	33	55	46	59	37	55	53	48
Mean	27	44	41	45	40	46	46	41

Coeff. variation - 22%

LSD (P 0.05) Treatment 12.9; Host 4.89
Inoc. 5.79. Host x inoc. = NS.

Dry weight (gm) - Sept. 29.

Host	Nil	CC 2238b	CC 2480a	WU95	TA1	CC 2484g	CC 2470g	Mean
39327YB	3.97	4.92	5.35	7.55	4.81	3.86	6.18	5.23
Trikkala	5.40	8.48	7.82	9.42	6.63	7.85	7.25	7.55
Larisa	3.73	4.23	4.91	6.47	3.75	4.94	5.86	4.84
Yarloop	6.76	12.52	14.42	14.14	10.56	12.84	14.14	12.20
Woogenellup	5.34	7.20	10.79	13.79	5.53	10.25	7.05	8.56
Mean	5.04	7.47	8.66	10.27	6.25	7.95	8.10	7.68

Coeff. of variation = 32%. LSD (P 0.05)
Treatment 3.51, Host, 1.33. Inoc. 1.57.

Comments:

1. There was a nodulation response to inoculation for all hosts with all rhizobia except CC2484g on 39327YB and TA1 on Yarloop. There was a significant interaction between host and inoculant strain.
2. Inoculation increased plant yield on both sampling occasions. At the first occasion the yield tended to reflect nodulation (it can be seen that low yields were obtained with 39327YB inoculated with CC2484g and with TA1 on Yarloop).
3. WU95 was the superior strain.
4. TA1 was poor on Woogenellup.
5. The growth of Larisa was poor relative to all other hosts.

TRIAL 2. 77D7

An examination of the carryover of inoculation responses of subterranean clover into a second year.

Locality: Denmark Research Station
Soil: Loamy gravel. Jarrah.
History: New land cleared 1975.
Fertilizer: 1 tonne lime autumn 1977. At sowing 200 kg/ha mix No. 1. Cu, Zn, Mo superphosphate; 400 kg/ha plain super; 200 kg/ha muriate of potash; 50 kg/ha MnSO₄.
Sowing: Lime pelleted inoculated seed sown 4.0 cm apart in 2 metre rows, 50 cm apart. Sown into moist seed bed April 20.
Treatments: Yanninicums (39327YB, Trikkala, Larisa, Yarloop) and Woogenellup. Inoculants Nil, CC2238b, and WU95.

Dry Weight kg/ha. August.

Host	Nil	CC2238b	WU95
39327YB	292	362	571
Trikkala	877	843	1030
Larisa	313	467	794
Yarloop	383	348	801
Woogenellup	662	1455	850

Comments:

1. Not statistically analysed - extremely variable.
2. The apparent excellent performance of Woogenellup with CC2238b is not in accord with other findings.

TRIAL 3. 77D8/2994 EX

The response of Trifolium repens and T. fragiferum to inoculation on new land at Denmark.

Locality: Denmark Research Station.

Soil: Loamy gravel. Jarrah.

History: New land cleared 1975.

Fertilizer: 1 tonne lime autumn 1977. At sowing 200 kg/ha mix No. 1. Cu, Zn, Mo superphosphate; 400 kg/ha plain super; 200 kg/ha muriate of potash; 50 kg/ha MnSO₄.

Sowing: Lime pelleted inoculated seed sown 4.0 cm apart in 2 metre rows 50 cm apart. Sown into moist seed bed.

Treatments: T. repens (Louisiana white) and T. fragiferum (Palestine strawberry). Inoculants, Nil, CC2238b, CC2480a, WU95, TA1, CC2484g and CC2470g.

Nodulation: July 14.

Host	Nil	CC 2238b	CC 2480a	WU95	TA1	CC 2484g	CC 2470g	Mean
White clover	2.24	2.56	2.57	2.79	2.57	2.61	2.77	2.59
Strawberry clover	1.77	2.82	2.69	2.59	2.77	2.64	2.65	2.56
Mean	2.00	2.69	2.63	2.69	2.69	2.63	2.71	2.57

Coeff. variation 11.46%

LSD (P<0.05): Treatments 0.42; Host, N.S; Inoc. 0.30.

Dry weight - July 14 (mgm)

Host	Nil	CC 2238b	CC 2480a	WU95	TA1	CC 2484g	CC 2470g	Mean
White clover	11	11	18	14	34	24	24	19.6
Strawberry clover	8	24	23	25	34	16	30	23.1
Mean	9.5	17.5	20.5	19.5	34.0	20.0	27.0	21.3

Coeff. variation 30%

LSD (P<0.05): Treatment 9.04

There was a significant host x inoculant interaction.

Comments:

1. There was nodulation response with WU95 and CC2470g on white clover. Strawberry clover responded with all rhizobia.
2. There was a growth response to inoculation with white clover for TA1, CC2484g and CC2470g; TA2 was superior to the other two strains.

Strawberry clover responded with all hosts other than CC2484g. TA1 was the superior strain with this host also.

3. This trial will be sampled again next year.

1.2 Low Rainfall

TRIAL 4. 77M42.

The response of early flowering subterranean clovers to inoculation.

Locality: Merredin Research Station.

Soil: Norpa sand pH 4.5 (Call₂). Acacia, casuarina.

History: Cleared 1965. Fallow since 1968. Clover sown 1966 with 200 kg/ha Cu, Zn, Mo super- failed.

Fertilizer: 200 kg/ha plain super hand broadcast and raked in prior to sowing.

Sowing: Sown May 19 into dry soil. Lime pelleted and inoculated May 16. Sown 2 cm apart in 2 m rows 0.5 m apart.

Treatments: Northam A, Nungarin, Dwalganup and Geraldton.
Inoculants: CC2480a, CC2238b, WU95, TA1 and Nil.

Nodulation: August 24.

Host	CC2480a	CC2238b	WU95	TA1	Nil	Mean
Northam A	3.13	3.13	2.53	2.99	0.30	2.42
Dwalganup	2.44	2.75	2.14	2.63	0.22	2.04
Geraldton	2.77	2.98	2.85	2.95	0.44	2.40
Nungarin	2.82	2.96	3.05	3.00	0.39	2.44
Mean	2.79	2.95	2.64	2.90	0.34	2.32

Coeff. variation 15.57%

LSD (P 0.05): Treatment, 0.46; Host, 0.20; Inoc. 0.23.

Dry wt. per plant (mgm) - August 24.

Host	CC2480a	CC2238b	WU95	TA1	Nil	Mean
Northam A	89	92	66	80	98	85
Dwalganup	49	90	39	49	41	53
Geraldton	59	71	69	73	54	65
Nungarin	98	98	71	76	102	89
Mean	74	88	61	70	74	73

Coeff. variation 47%

LSD (P 0.05); Treatment, 43; Host, 19.3; Inoc. N.S.

Visual Ratings - August 24.

Host	CC2480a	CC2238b	WU95	TA1	Nil	Mean
Northam A	4.2	4.6	3.4	3.6	4.4	4.0
Dwalganup	2.7	3.7	3.3	3.0	3.0	3.1
Geraldton	3.8	4.0	3.4	2.6	3.2	3.4
Nungarin	3.4	3.6	3.2	3.6	2.8	3.3
Mean	3.5	4.0	3.3	3.2	3.4	3.5

Dry wt. per plant (mgm) - October 5.

Host	CC2480a	CC2238b	WU95	TA1	Nil	Mean
Northam A	390	390	460	440	410	416
Dwalganup	300	340	280	250	230	280
Geraldton	370	470	370	330	330	375
Nungarin	330	430	400	500	360	405
Mean	347	410	376	380	335	369

No significant differences.

Comments:

1. The dry winter resulted in a very much delayed germination and very poor growth of the plants.
2. There was a marked nodulation response to inoculation.

TRIAL 5. 77M43/2994 EX

An examination of the carryover of inoculation responses of early flowering subterranean clover into a second year.

Location: Merredin Research Station.

Not sampled because of drought.

TRIAL 6. 77ME30/2994 EX

The response of early flowering subterranean clovers to inoculation.

Location: R. Bayley - Wilgoyne.

Not sampled because of drought.

TRIAL 7. 77ME31/2994 EX

An examination of the carryover of inoculation responses of early flowering subterranean clovers to inoculation.

Location: R. Bayley - Wilgoyne.

Not sampled because of drought.

TRIAL 8. 77TS34/2994 EX

The response of early flowering subterranean clovers to inoculation.

Locality: Bunjil (R. Anderson)

Soil: Yellow sandplain. Mallee - Wodjil.

History: New land. Cropped 1976.

Fertilizer: 200 kg/ha plain super.

Sowing: Sown May 25. Seed inoculated and lime pelleted May 24.
Sown 2 cm apart in 2 m rows 0.5m apart.

Treatments: Northam A., Nungarin, Dwalganup, Geraldton.
Inoculants; CC2480a, CC2238b, WU95, TA1 and Nil.

Nodulation: August 17.

Host	CC2480a	CC2238b	WU95	TA1	Nil	Mean
Northam A	3.54	3.48	3.21	3.34	3.27	3.34
Dwalganup	2.93	2.76	2.80	2.66	2.98	2.83
Geraldton	3.72	3.53	3.69	3.52	3.63	3.62
Nungarin	3.19	3.22	3.06	3.06	2.94	3.09
Mean	3.34	3.25	3.19	3.15	3.21	3.23

Coeff. variation 12.06%

LSD (P<0.08) Treatment 0.49; Host. 0.22.

Dry wt per plant (mgm) August 17.

Host	CC2480a	CC2238b	WU95	TA1	Nil	Mean
Northam A	65	66	59	47	57	59
Dwalganup	41	35	37	38	42	39
Geraldton	48	63	51	45	53	52
Nungarin	61	64	52	59	56	58
Mean	54	57	50	47	52	52

Coeff. variation 19.52%

LSD (P<0.05): Treatment, 12.78; Host, 5.72; Inoc. 6.39.

Comments:

1. There was no worthwhile response to inoculation.
2. The trial was drought affected.
3. Dwalganup did not nodulate as well as the other hosts.

TRIAL 9. 77TS35/2994 EX

An examination of the carryover of inoculation responses of early flowering subterranean clovers into a second year.

Locality: Bunjil (R. Anderson)

Soil: Yellow sandplain. Mallee - Wodjil.

History: New land. Cropped 1976.

Fertilizer: Nitrogen added twice (planting and mid winter) 30 kg/ha N as urea each time.

Sowing: Sown May 25. Seed inoculated and lime pelleted May 24.
Sown 2 cm apart in 4 x 2m rows 0.5 m apart.

Treatments: Northam A, Nungarin, Dwalganup, Geraldton.
Inoculants: WU95, WU95 + Nitrogen, CG2238b, Nil.

Nodulation: September 21.

Host	Nil	WU95	WU95 + N	CG2238b	Mean
Northam A	3.90	3.67	3.42	3.73	3.68
Dwalganup	3.69	3.43	3.39	3.39	3.48
Geraldton	4.06	3.96	3.81	4.03	3.97
Nungarin	3.83	3.67	3.59	3.53	3.66
Mean	3.87	3.68	3.55	3.67	3.69

Coeff. variation 11.07%

LSD (P<0.05%). Host = 0.26

Dry wt per plant (mgm) September 21.

Host	Nil	WU95	WU95 + N	CC2238b	Mean
Northam A	494	524	616	428	516
Dwalganup	424	326	448	334	383
Geraldton	562	418	536	474	498
Nungarin	524	468	500	448	485
Mean	501	434	525	421	470

Coeff. variation 27.7%

LSD (P 0.05): Host, 82;. Inoc. 82.

Comments:

1. Drought affected.
2. Nodulation of non-inoculated controls was very good.
3. Nitrogen improved yield with WU95.

TRIAL 10 77TS36/2994 EX.

Response of early flowering subterranean clovers to inoculation.

Locality: Perenjori (R. Hesford)
Soil: Brown sandy loam. Mallee.
History: Old land with good super history.
Geraldton subclover sown some years ago but did not persist (second year mortality).
Fertilizer: 200 kg/ha plain super.
Sowing: Sown May 26 - Seed inoculated and lime pelleted
May 24. Sown 2 cm apart in rows 0.5 m apart.
Treatments: Northam A, Nungarin, Dwalganup, Geraldton.
Inoculants: CC2480a, CC2238b, WU95, TA1 and Nil.
Nodulation: August 17.

Host	CC2480a	CC2238b	WU95	TA1	Nil	Mean
Northam A	3.45	3.42	2.91	2.58	1.57	2.79
Dwalganup	2.79	2.75	2.46	2.48	1.53	2.40
Geraldton	3.42	3.71	3.52	3.28	2.08	3.20
Nungarin	3.16	3.39	3.25	2.87	1.71	2.88
Mean	3.20	3.32	3.04	2.81	1.72	2.82

Coeff. variation 11.8%

LSD (P 0.05): Treatment 0.42, Host 0.19; Inoc. 0.21.

Dry wt. per plant (mgm) August 17.

Host	CC2480a	CG2238b	WU95	TA1	Nil	Mean
Northam A	66	78	64	64	60	66
Dwalganup	34	40	40	41	37	38
Geraldton	42	57	48	55	40	48
Nungarin	54	55	58	56	48	54
Mean	49	58	52	54	46	52

Coeff. variation 19.5%

LSD (P 0.05): Treatment 12.7; Host 5.7; Inoc. 6.4.

Comments:

1. Drought affected.
2. Nodulation response to inoculation with all hosts.

TRIAL 11 77TS37/2994 EX

An examination of the carryover of inoculation responses of early flowering subterranean clovers into a second year.

Location: Perenjori (R. Hesford)

Not sampled because of drought.

2. CLOVER SCORCH (TRIAL 2)

Four hundred and eighty clover varieties, cultivars and crossbreds were screened in the field for tolerance to the clover scorch disease.

The varieties and cultivars totalled 190 and comprised: 29 promising ones from earlier tests, mainly from Morocco and Spain; 2 from Victoria that had shown tolerance in Kabatiella screening tests in Victorian Department of Agriculture tests; 112, including a T. yannicum, collected by Francis, Katznelson and Collins in Turkey; 41 other T. yannicum varieties, mainly from Greece and 6 control varieties/cultivars.

Contrary to the experience of 1976, a very mild year for clover scorch, no clovers tested showed immunity to the disease (or at least showed any reaction to infection). Most clovers were very seriously affected.

Those clovers that reacted least are shown in Table 1. The difference between 1976 and 1977 in disease intensity is clear from the following: of 24 varieties that gave a rating of 3 or less in 1976 and tested again none rated less than 3 in 1977, two gave a rating of three, five a rating of four, four a rating of five, two rated six and 11 more than six. Despite these high ratings some very promising material was obtained, most coming from Spain.

Only two of the 112 clover Turkish collection showed any promise, 6999B and 70043.

Although the disease was extremely serious in 1977, a number of the 290 crossbreds gave low ratings (Table 2).

Taken on a family basis the Daliak x Woogenellup crosses (DAW) showed a high proportion with low ratings. They were much better than the Daliak x Midland B x Nangeela (DMN), Guildford D x H20.1 (GDH20.1) and Guildford D x H20.2 (GDH20.2). Guildford D x Dalkeith crosses were particularly susceptible. It is interesting to note that some Midland B x Nangeela x Dinninup (MND) crosses, viz. MND 7.1, 7.2, 7.3 and 9.2 are reasonably tolerant, despite the known susceptibility of all parents.

A disturbing observation over the past three years, but particularly in the 1976 and 1977 trials, is the apparent seriousness of leaf scorch disorders caused by factors other than Kabatiella. This scorching is very easily confused with Kabatiella and is most prominent on, although not confined to, Daliak, its relatives (various crosses) and presumed relatives (e.g. Guildford D). Pepper spot, caused by Leptosphaerulina trifolii, has consistently been isolated and observed from affected plants (Table 2), as well as clover rust, caused by Uromyces trifolii. It may well be that pepper spot, which seems to be most prevalent late in the life of the plant, does not get the opportunity to seriously affect many other clovers (which could be as susceptible to it as Daliak types) because these clovers have been more seriously affected by Kabatiella at an earlier stage.

Work needs to be done on assessing the seriousness of pepper spot and other diseases and on separating out the affects of Kabatiella and alternative diseases. It would be most awkward if a new Kabatiella resistant clover was developed and found to be seriously scorched by something other than Kabatiella.

TABLE 1 - THE MOST TOLERANT VARIETIES IN THE 1977 SCREENING TRIALS AT DENMARK.

Variety	Rating*
68036E (GS 010.2)	3
68042G (GS 057.3)	"
69999B	"
68039 (GS 041)	4
68040G (GS 042.11)	"
68042F (GS 057.1)	"
68043E (GS 058.2)	"
68043I (GS 058.5)	"
68043F (GS 058.13)	"
68036F (GS 010.3)	5
68040I (GS 042.8)	"
68040G (GS 042.12)	"
68041B (GS 052.2)	"
65188 T (GT 034.1.8)	"
70043	"
39315YC	"
39327YB	"
39357YB	"
65113D (GM 118.4)	6
68040B (GS 042.10)	"
Rouen	"
14198	"
39357YA	"
39371YB	"
39379YA	

* Rated 0 = no disease to 10 = death.

TABLE 2 - The most tolerant crosses in the 1977 Screening Trials at Denmark.

Cross	Rating †	Cross	Rating †	Cross	Rating †
DAW 10.1*	0-1	DMN 18.2*		(Y68D 21.4.2*)	
DAW 10.2*		DMR 22.3		Y68D 22.4.1	
IDA 14		DMR 26.1		Y68D 22.4.2*	6
(Y47D 1.1.1*)		MND 7.1		DAW 5.1	
DAW 9.1*	2-2.5	MND 7.2		DAW 12.1	
DAW 14.1*		MND 7.3		DMN 5.1	
DAW 17.1		DA20.19.1		DA 20 19.2	
DMN 12.3		IDA2*		GD 20.1.6	
DMR 26.2*		IGD 10*		IGD4	
210.10.26.1*		GD 56.8*		IGD6	
IGD 9*		GD 56.10*		DAO8.9*	
DAW 13.1*		Y68D 4.3.2		DAO8.10	
DAW 13.2*		DAY 10		GD 17.1*	
DMR 22.2		DAW 12.2	5-5.5	GD 17.2	
IGD8*		DAW 14.2		GD 17.33	
DA 08.3*		DMN 16.1		Y47D 5.1.1	
DA 08.8*		MND 9.2*		Y68D 1.2.3	
GD 56.2*		DA 20.17.1*		Y68D 6.3.1	
GD 56.16		GD 20.2.9		Y68D 6.3.2	
Y68D 17.1.2*		IDA 15*		Y68D 6.4.3	
Y68D 24.4.1*		1GD7*		Y68D 17.1.4	
Y68D 24.4.3*		GD 17.11		Y68D 22.1.3	
DAY 6*		Y68D 1.2.2		Y68D 23.2.1	
DAW 17.2	4-4.5	Y68D 4.3.1		Y68D 23.3.2	
DAW 17.3		Y68D 6.4.1		Y68D 23.3.3	
DMN 13.1		Y68D 19.5.1			

Crosses in parentheses were given high ratings on final assessment, but this was subsequently assumed to be caused by something other than Kabatiella.

*Seriously affected (leaf scorched) by pepper spot (Leptosphaerulina trifolii).

Ø DAO8 = Daliak x 30908; DA20 = Daliak x H20 (H20 = Midland B x Howard).
DAW = Daliak x Woogenellup; DAY = Daliak x 39327YB;
DMN = Daliak x Midland B x Nangeela; DMR = Daliak x Midland B x Ruakura; GD17 = Guildford D x MN17.1 (MN17.1 = Midland B x Nangeela); GD20.1 = Guildford D x H20.1 (H20.1 = Midland B x Howard); GD56 = Guildford D x MN56.2 (MN56.2 = Midland B x Nangeela); IDA = 47308E x Daliak; IGD = 47308E x Guildford D; MND = Midland B x Nangeela x Dinninup; Y47D = Y47 x Daliak; Y68D = Y68 x Daliak.

† Rated 0 = no disease to 10 = death.

3. RYE GRASS TOXICITY - (TRIAL 13)

A glasshouse experiment (with B. Stynes) was conducted in which attempts were made to produce slime galls and toxicity in the glasshouse.

Rye grass plants grown in pots were inoculated with macerated nematode and bacterial galls (both singly and together) and a pure culture of galls and the bacterial isolate came from a toxic paddock at Katanning.

Treatments:

Inoculant:

1. Nematode galls only (2 per plant).
2. Bacterial galls + nematode galls (2 of each per plant).
3. Bacterial slime + nematode galls (2 per plant).

Humidity

1. No humidity.
2. Plastic cover over plants (5 days per week from inoculation).

Sand collar

1. No sand collar (empty poly. tube).
2. A collar of sand, aimed at reducing movement of inoculated nematodes away from plant. Small polyethylene tubes, 2 cm high x 1 cm diameter were placed around newly emerged seedlings and filled with sieved sand (150 microns).

Replications

5 (A total of 60 pots, each with 5 plants)

Inoculation

All plants were inoculated on five occasions; 2 days after emergence (= day 2), day 14, day 28, day 42 and day 56.

TABLE 1. The production of Rye grass toxicity in the glasshouse: The effect of humidity and the movement of nematodes away from plants (by means of sand collars) on numbers of plant spikes affected by bacterial slime.

Treatments	Number of affected pots, plants and spikes*						
			Spikes				Total
	Pots	Plants	Emerged	Part emerged	Early emergence	Distorted	
Sand collar + Humidity	1(5)	1(25)	6(38)	2(16)	0(9)	0(0)	8(63)
- Humidity	5(5)	12(25)	36(105)	7(16)	0(3)	8(8)	51(132)
No collar + Humidity	3(5)	3(25)	5(24)	0(9)	0(10)	0(0)	5(43)
- Humidity	5(5)	9(25)	18(96)	0(9)	0(8)	1(1)	19(114)

*Distorted spikes - refers to spikes that were unable to emerge because of thick growth of corynebacteria.

Figures in parentheses refer to totals (i.e. affected plus non affected).

RESULTS

Yellow slime and both nematode and bacterial galls were produced in this successful glasshouse experiment. The results in Table 1 refer only to that part of the experiment inoculated with nematode galls. No slime or galls were found in those plants inoculated with nematode galls mixed with either bacterial galls or a pure culture of bacteria. This finding suggests that the bacteria mixed with the nematode either kills the latter or somehow restricts its movement into the plant and indirectly supports the belief that bacteria are dependent on the nematode to enter the plant.

Most success was achieved with those plants not subjected to a humidity treatment. However, the treatment was excessive and had a marked deleterious influence on plant growth (note the low number of spikes with the humidity treatment). The sand collar had no affect with humidity but roughly doubled the proportion of infected spikes on plants not placed under a humidity hood.

All spikes from this experiment have been collected and nematode galls, bacterial galls, seed and immature seed are being separated out. Toxicity tests will be conducted on the galls.